

Appendix 1

1. Original class file: (e.g. GraphApplet.class)

1A. - List of constants in class file

Constant 1 = <Class java.awt.Component>
Constant 2 = <Class java.applet.Applet>
Constant 3 = <Class java.awt.Dimension>
Constant 4 = <Class GraphApplet>
Constant 5 = <Class java.lang.Math>
Constant 6 = <Class java.awt.Graphics>
Constant 7 = <Method java.awt.Graphics.drawLine(III)V>
Constant 8 = <Field java.awt.Dimension.height I>
Constant 9 = <Field java.awt.Dimension.width I>
Constant 10 = <Method java.awt.Component.size()Ljava/awt/Dimension;>
Constant 11 = <Method java.lang.Math.cos(D)D>
Constant 12 = <Method java.applet.Applet.<init>()V>
Constant 13 = <Method java.lang.Math.sin(D)D>
Constant 14 = <Method GraphApplet.f(D)D>
Constant 15 = <NameAndType sin (D)D>
Constant 16 = <NameAndType cos (D)D>
Constant 17 = <NameAndType width I>
Constant 18 = <NameAndType f (D)D>
Constant 19 = <NameAndType <init> ()V>
Constant 20 = <NameAndType drawLine (III)V>
Constant 21 = <NameAndType size ()Ljava/awt/Dimension;>
Constant 22 = <NameAndType height I>
Constant 23 = <Double 7.000000>
Constant 24 = <Unknown 128 (0x80)>
Constant 25 = <Double 5.000000>
Constant 26 = <Unknown 128 (0x80)>
Constant 27 = <Double 4.000000>
Constant 28 = <Unknown 128 (0x80)>
Constant 29 = <Double 2.000000>
Constant 30 = <Unknown 128 (0x80)>
Constant 31 = <"(Ljava/awt/Graphics;)V">
Constant 32 = <"(D)D">
Constant 33 = <"this">
Constant 34 = <"java/awt/Dimension">
Constant 35 = <"width">
Constant 36 = <"GraphApplet.java">
Constant 37 = <"height">
Constant 38 = <"ConstantValue">
Constant 39 = <"LocalVariableTable">
Constant 40 = <"Exceptions">

1B - Methods defined in class file

1B1. Method double f(double)

<u>loc</u>	<u>opcode</u>	<u>argument</u>	<u>meaning of arg</u>
00	dload_1		
01	ldc2_w	#25	<Double 5.000000>
04	ddiv		
05	invokestatic	#11	<Method java.lang.Math.cos(D)D>
08	dload_1		
09	ldc2_w	#23	<Double 7.000000>
12	ddiv		
13	invokestatic	#13	<Method java.lang.Math.sin(D)D>
16	dadd		
17	ldc2_w	#29	<Double 2.000000>
20	dadd		
21	aload_0		
22	invokevirtual	#10	<Method java.awt.Component.size()Ljava/awt/Dimension;>
25	getfield	#8	<Field java.awt.Dimension.height I>
28	i2d		
29	dmul		
30	ldc2_w	#27	<Double 4.000000>
33	ddiv		
34	dreturn		

1B2. Method void paint(java.awt.Graphics)

<u>loc</u>	<u>opcode</u>	<u>argument</u>	<u>meaning of arg</u>
00	iconst_0		
01	istore_2		
02	goto	32	(location 32)
05	aload_1		
06	iload_2		
07	aload_0		
08	iload_2		
9	i2d		
10	invokevirtual	#14	<Method GraphApplet.f(D)D>
13	d2i		
14	iload_2		
15	iconst_1		
16	iadd		

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17	aload_0		
18	iload_2		
19	iconst_1		
20	iadd		
21	i2d		
22	invokevirtual	#14	<Method GraphApplet.f(D)D>
25	d2i		
26	invokevirtual	#7	<Method java.awt.Graphics.drawLine(III)V>
29	iinc	21	(incr local arg #2 by +1)
32	iload_2		
33	aload_0		
34	invokevirtual	#10	<Method java.awt.Component.size()Ljava/awt/Dimension;>
37	getfield	#9	<Field java.awt.Dimension.width I>
40	if_icmplt	5	(location 5)
43	return		

2. Sorted dictionaries -- starting from GraphApplet.class

2A - 112 classes

0 GraphApplet
1 java/applet/Applet
2 java/applet/AppletContext
3 java/applet/AppletStub
4 java/applet/AudioClip
5 java/awt/AWTError
6 java/awt/Color
7 java/awt/Component
8 java/awt/Container
9 java/awt/Dimension
10 java/awt/Event
11 java/awt/FlowLayout
12 java/awt/Graphics
13 java/awt/image/ImageObserver
14 java/awt/Insets
15 java/awt/LayoutManager
16 java/awt/Panel
17 java/awt/peer/ComponentPeer
18 java/awt/peer/ContainerPeer
19 java/awt/Point
20 java/awt/Polygon
21 java/awt/Rectangle
22 java/awt/Toolkit
23 java/io/BufferedInputStream
24 java/io/BufferedOutputStream
25 java/io/File
26 java/io/FileDescriptor
27 java/io/FileInputStream
28 java/io/FilenameFilter
29 java/io/FileNotFoundException
30 java/io/FileOutputStream
31 java/io/FilterInputStream
32 java/io/FilterOutputStream
33 java/io/InputStream
34 java/io/InterruptedIOException
35 java/io/IOException
36 java/io/OutputStream
37 java/io/PrintStream
38 java/lang/ArithmeticException
39 java/lang/ArrayIndexOutOfBoundsException
40 java/lang/ArrayStoreException
41 java/lang/Character
42 java/lang/Class

90 java/net/InetAddress
91 java/net/MalformedURLException
92 java/net/UnknownContentHandler
93 java/net/UnknownHostException
94 java/net/UnknownServiceException
95 java/net/URL
96 java/net/URLConnection
97 java/net/URLStreamHandler
98 java/net/URLStreamHandlerFactory
99 java/util/Date
100 java/util/Dictionary
101 java/util/Enumeration
102 java/util/Hashtable
103 java/util/HashtableEntry
104 java/util/HashtableEnumerator
105 java/util/NoSuchElementException
106 java/util/Properties
107 java/util/Random
108 java/util/StringTokenizer
109 java/util/Vector
110 java/util/VectorEnumerator
111 [Ljava/net/InetAddress

2B - 415 methods

0 <clinit>()V
1 <init>()V
2 <init>(D)V
3 <init>(F)V
4 <init>(I)V
5 <init>(IF)V
6 <init>(II)V
7 <init>(III)V
8 <init>(III)V
9 <init>(IIII)V
10 <init>(J)V
11 <init>(Ljava/io/FileDescriptor;)V
12 <init>(Ljava/io/InputStream;)V
13 <init>(Ljava/io/InputStream;I)V
14 <init>(Ljava/io/OutputStream;)V
15 <init>(Ljava/io/OutputStream;I)V
16 <init>(Ljava/io/OutputStream;Z)V
17 <init>(Ljava/lang/Object;JIIIIILjava/lang/Object;)V
18 <init>(Ljava/lang/String;)V
19 <init>(Ljava/lang/String;Ljava/lang/String;)V
20 <init>(Ljava/lang/String;Ljava/lang/String;ILjava/lang/String;)V
21 <init>(Ljava/lang/String;Ljava/lang/String;Z)V
22 <init>(Ljava/lang/String;[B)V
23 <init>(Ljava/lang/StringBuffer;)V
24 <init>(Ljava/lang/ThreadGroup;Ljava/lang/String;)V
25 <init>(Ljava/net/URL;Ljava/lang/String;)V
26 <init>(Ljava/util/Properties;)V
27 <init>(Ljava/util/Vector;)V
28 <init>([BII)V
29 <init>([C)V
30 <init>([CII)V
31 <init>([Ljava/util/HashtableEntry;Z)V
32 HSBtoRGB(FFF)I
33 UTC(IIII)J
34 accept(Ljava/io/File;Ljava/lang/String;)Z
35 action(Ljava/awt/Event;Ljava/lang/Object;)Z
36 activeCount()I
37 activeGroupCount()I
38 add(II)V
39 add(Ljava/awt/Component;)Ljava/awt/Component;
40 add(Ljava/awt/Component;I)Ljava/awt/Component;
41 add(Ljava/lang/Thread;)V
42 add(Ljava/lang/ThreadGroup;)V


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137 gc()V
138 get(Ljava/lang/Object;)Ljava/lang/Object;
139 getAppletContext()Ljava/applet/AppletContext;
140 getAudioClip(Ljava/net/URL;)Ljava/applet/AudioClip;
141 getAudioClip(Ljava/net/URL;Ljava/lang/String;)Ljava/applet/AudioClip;
142 getBackground()Ljava/awt/Color;
143 getBlue()I
144 getBoundingBox()Ljava/awt/Rectangle;
145 getByName(Ljava/lang/String;)Ljava/net/InetAddress;
146 getChars(II[CI)V
147 getClass()Ljava/lang/Class;
148 getCodeBase()Ljava/net/URL;
149 getColor()Ljava/awt/Color;
150 getColor(Ljava/lang/String;Ljava/awt/Color;)Ljava/awt/Color;
151 getColorModel()Ljava/awt/image/ColorModel;
152 getComponent(I)Ljava/awt/Component;
153 getContent()Ljava/lang/Object;
154 getContent(Ljava/net/URLConnection;)Ljava/lang/Object;
155 getContentTypeHandler()Ljava/net/ContentTypeHandler;
156 getContentType()Ljava/lang/String;
157 getDefaultToolkit()Ljava/awt/Toolkit;
158 getDocumentBase()Ljava/net/URL;
159 getFile()Ljava/lang/String;
160 getFont()Ljava/awt/Font;
161 getFontMetrics(Ljava/awt/Font;)Ljava/awt/FontMetrics;
162 getForeground()Ljava/awt/Color;
163 getGraphics()Ljava/awt/Graphics;
164 getGreen()I
165 getHeaderField(Ljava/lang/String;)Ljava/lang/String;
166 getHeaderFieldDate(Ljava/lang/String;J)J
167 getHeaderFieldInt(Ljava/lang/String;I)I
168 getHost()Ljava/lang/String;
169 getHostByAddr(I)Ljava/lang/String;
170 getImage(Ljava/net/URL;)Ljava/awt/Image;
171 getInCheck()Z
172 getInetFamily()I
173 getInputStream()Ljava/io/InputStream;
174 getInteger(Ljava/lang/String;)Ljava/lang/Integer;
175 getInteger(Ljava/lang/String;Ljava/lang/Integer;)Ljava/lang/Integer;
176 getLocalHostName()Ljava/lang/String;
177 getLocalizedInputStream(Ljava/io/InputStream;)Ljava/io/InputStream;
178 getLocalizedOutputStream(Ljava/io/OutputStream;)Ljava/io/OutputStream;
179 getLong(Ljava/lang/String;Ljava/lang/Long;)Ljava/lang/Long;
180 getMaxPriority()I
181 getMessage()Ljava/lang/String;
182 getName()Ljava/lang/String;
183 getParameter(Ljava/lang/String;)Ljava/lang/String;

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184 getParent()Ljava/lang/String;
185 getPath()Ljava/lang/String;
186 getPort()I
187 getPriority()I
188 getProperty(Ljava/lang/String;)Ljava/lang/String;
189 getProperty(Ljava/lang/String;Ljava/lang/String;)Ljava/lang/String;
190 getProtocol(Ljava/lang/String;
191 getRed()I
192 getRef(Ljava/lang/String;
193 getRuntime()Ljava/lang/Runtime;
194 getSecurityManager()Ljava/lang/SecurityManager;
195 getThreadGroup()Ljava/lang/ThreadGroup;
196 getTime()J
197 getToolkit()Ljava/awt/Toolkit;
198 getURLStreamHandler(Ljava/lang/String;)Ljava/net/URLStreamHandler;
199 getValue()[C
200 gotFocus(Ljava/awt/Event;Ljava/lang/Object;)Z
201 handleEvent(Ljava/awt/Event;)Z
202 hasMoreElements()Z
203 hasMoreTokens()Z
204 hashCode()I
205 hide()V
206 hostsEqual(Ljava/lang/String;Ljava/lang/String;)Z
207 indexOf(I)I
208 indexOf(II)I
209 indexOf(Ljava/lang/Object;)I
210 indexOf(Ljava/lang/Object;I)I
211 indexOf(Ljava/lang/String;)I
212 indexOf(Ljava/lang/String;I)I
213 init()V
214 init(Ljava/lang/ThreadGroup;Ljava/lang/Runnable;Ljava/lang/String;)V
215 initProperties(Ljava/util/Properties;)Ljava/util/Properties;
216 initSystemFD(Ljava/io/FileDescriptor;I)Ljava/io/FileDescriptor;
217 initializeLinker()V
218 initializeLinkerInternal(Ljava/lang/String;
219 insert(ILjava/lang/String;)Ljava/lang/StringBuffer;
220 insets()Ljava/awt/Insets;
221 inside(II)Z
222 intValue()I
223 interrupt()V
224 invalidate()V
225 isAbsolute()Z
226 isActive()Z
227 isAlive()Z
228 isDaemon()Z
229 isDirectory()Z
230 isFile()Z

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231 isInfinite(D)Z
232 isInfinite(F)Z
233 isInterface()Z
234 isLetter(C)Z
235 isLetterOrDigit(C)Z
236 isNaN(D)Z
237 isNaN(F)Z
238 isShowing()Z
239 join(J)V
240 keyDown(Ljava/awt/Event;I)Z
241 keyUp(Ljava/awt/Event;I)Z
242 keys()Ljava/util/Enumeration;
243 lastIndexOf(I)I
244 lastIndexOf(II)I
245 lastIndexOf(Ljava/lang/Object;I)I
246 lastIndexOf(Ljava/lang/String;I)I
247 lastModified()J
248 layout()V
249 layoutContainer(Ljava/awt/Container;)V
250 length()I
251 length0()J
252 list()[Ljava/lang/String;
253 list(Ljava/io/PrintStream;I)V
254 list0()[Ljava/lang/String;
255 load(Ljava/lang/String;)V
256 loadFileInternal(Ljava/lang/String;)Z
257 loadLibrary(Ljava/lang/String;)V
258 locate(II)Ljava/awt/Component;
259 log(D)D
260 longValue()J
261 lookupAllHostAddr(Ljava/lang/String;)[[B
262 lookupHostAddr(Ljava/lang/String;)[B
263 lostFocus(Ljava/awt/Event;Ljava/lang/Object;)Z
264 makeAnyLocalAddress(Ljava/net/InetAddress;)V
265 mark(I)V
266 markSupported()Z
267 max(II)I
268 metaDown()Z
269 min(II)I
270 minimumLayoutSize(Ljava/awt/Container;)Ljava/awt/Dimension;
271 minimumSize()Ljava/awt/Dimension;
272 mkdir()Z
273 mkdir0()Z
274 mkdirs()Z
275 mouseDown(Ljava/awt/Event;II)Z
276 mouseDrag(Ljava/awt/Event;II)Z
277 mouseEnter(Ljava/awt/Event;II)Z

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278 mouseExit(Ljava/awt/Event;II)Z
279 mouseMove(Ljava/awt/Event;II)Z
280 mouseUp(Ljava/awt/Event;II)Z
281 move(II)V
282 moveComponents(Ljava/awt/Container;IIIII)V
283 newInstance()Ljava/lang/Object;
284 next(I)I
285 nextDouble()D
286 nextElement()Ljava/lang/Object;
287 nextFocus()V
288 nextThreadNum()I
289 nextToken(Ljava/lang/String;
290 notifyAll()V
291 open(Ljava/lang/String;)V
292 openConnection()Ljava/net/URLConnection;
293 openConnection(Ljava/net/URL;)Ljava/net/URLConnection;
294 paint(Ljava/awt/Graphics;)V
295 paintAll(Ljava/awt/Graphics;)V
296 paramString()Ljava/lang/String;
297 parse(Ljava/lang/String;)J
298 parseInt(Ljava/lang/String;)I
299 parseInt(Ljava/lang/String;I)I
300 parseLong(Ljava/lang/String;I)J
301 parseURL(Ljava/net/URL;Ljava/lang/String;II)V
302 play()V
303 postEvent(Ljava/awt/Event;)Z
304 preferredLayoutSize(Ljava/awt/Container;)Ljava/awt/Dimension;
305 preferredSize()Ljava/awt/Dimension;
306 prepareImage(Ljava/awt/Image;IILjava/awt/image/ImageObserver;)Z
307 print(C)V
308 print(D)V
309 print(F)V
310 print(I)V
311 print(J)V
312 print(Ljava/awt/Graphics;)V
313 print(Ljava/lang/Object;)V
314 print(Ljava/lang/String;)V
315 print(Z)V
316 print([C)V
317 printAll(Ljava/awt/Graphics;)V
318 printStackTrace()V
319 printStackTrace(Ljava/io/PrintStream;)V
320 printStackTrace0(Ljava/io/PrintStream;)V
321 println(Ljava/lang/Object;)V
322 println(Ljava/lang/String;)V
323 put(Ljava/lang/Object;Ljava/lang/Object;)Ljava/lang/Object;
324 read()I

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371 startsWith(Ljava/lang/String;I)Z
 372 stop()V
 373 stop(Ljava/lang/Throwable;)V
 374 stop0(Ljava/lang/Object;)V
 375 substring(I)Ljava/lang/String;
 376 substring(II)Ljava/lang/String;
 377 suspend()V
 378 suspend0()V
 379 toCharArray()[C
 380 toExternalForm(Ljava/lang/String;
 381 toExternalForm(Ljava/net/URL;)Ljava/lang/String;
 382 toHexString(I)Ljava/lang/String;
 383 toLowerCase()Ljava/lang/String;
 384 toLowerCase(C)C
 385 toString()Ljava/lang/String;
 386 toString(D)Ljava/lang/String;
 387 toString(F)Ljava/lang/String;
 388 toString(II)Ljava/lang/String;
 389 toString(JI)Ljava/lang/String;
 390 toUnsignedString(II)Ljava/lang/String;
 391 toUnsignedString(JI)Ljava/lang/String;
 392 toUpperCase(C)C
 393 translate(II)V
 394 uncaughtException(Ljava/lang/Thread;Ljava/lang/Throwable;)V
 395 updateBounds(II)V
 396 validate()V
 397 valueOf(C)Ljava/lang/String;
 398 valueOf(D)Ljava/lang/String;
 399 valueOf(F)Ljava/lang/String;
 400 valueOf(I)Ljava/lang/String;
 401 valueOf(J)Ljava/lang/String;
 402 valueOf(Ljava/lang/Object;)Ljava/lang/String;
 403 valueOf(Ljava/lang/String;)Ljava/lang/Double;
 404 valueOf(Ljava/lang/String;)Ljava/lang/Float;
 405 valueOf(Ljava/lang/String;)Ljava/lang/Integer;
 406 valueOf(Ljava/lang/String;)Ljava/lang/Long;
 407 valueOf(Ljava/lang/String;I)Ljava/lang/Integer;
 408 valueOf(Ljava/lang/String;I)Ljava/lang/Long;
 409 valueOf(Z)Ljava/lang/String;
 410 valueOf([C)Ljava/lang/String;
 411 wait(J)V
 412 write(I)V
 413 write([BII)V
 414 writeBytes([BII)V

2C - 223 fields

0 java/applet/Applet.stub Ljava/applet/AppletStub;
1 java/awt/Color.black Ljava/awt/Color;
2 java/awt/Color.blue Ljava/awt/Color;
3 java/awt/Color.cyan Ljava/awt/Color;
4 java/awt/Color.darkGray Ljava/awt/Color;
5 java/awt/Color.gray Ljava/awt/Color;
6 java/awt/Color.green Ljava/awt/Color;
7 java/awt/Color.lightGray Ljava/awt/Color;
8 java/awt/Color.magenta Ljava/awt/Color;
9 java/awt/Color.orange Ljava/awt/Color;
10 java/awt/Color.pData I
11 java/awt/Color.pink Ljava/awt/Color;
12 java/awt/Color.red Ljava/awt/Color;
13 java/awt/Color.value I
14 java/awt/Color.white Ljava/awt/Color;
15 java/awt/Color.yellow Ljava/awt/Color;
16 java/awt/Component.background Ljava/awt/Color;
17 java/awt/Component.enabled Z
18 java/awt/Component.font Ljava/awt/Font;
19 java/awt/Component.foreground Ljava/awt/Color;
20 java/awt/Component.height I
21 java/awt/Component.parent Ljava/awt/Container;
22 java/awt/Component.peer Ljava/awt/peer/ComponentPeer;
23 java/awt/Component.valid Z
24 java/awt/Component.visible Z
25 java/awt/Component.width I
26 java/awt/Component.x I
27 java/awt/Component.y I
28 java/awt/Container.component [Ljava/awt/Component;
29 java/awt/Container.layoutMgr Ljava/awt/LayoutManager;
30 java/awt/Container.ncomponents I
31 java/awt/Dimension.height I
32 java/awt/Dimension.width I
33 java/awt/Event.arg Ljava/lang/Object;
34 java/awt/Event.clickCount I
35 java/awt/Event.data I
36 java/awt/Event.id I
37 java/awt/Event.key I
38 java/awt/Event.modifiers I
39 java/awt/Event.target Ljava/lang/Object;
40 java/awt/Event.when J
41 java/awt/Event.x I
42 java/awt/Event.y I
43 java/awt/FlowLayout.align I
44 java/awt/FlowLayout.hgap I

#4 < 0x40000000 0x00000000 = D 2.0 >
 #6 < 0x40100000 0x00000000 = D 4.0 >

3B - concentrated code

method #125 f(D)D

<u>loc</u>	<u>opcode</u>	<u>argument</u>	<u>meaning of arg</u>
00	dload_1		
01	ldc2_w	#0	< 0x40140000 0x00000000 = D 5.0 >
04	ddiv		
05	invokestatic	#85	java/lang/Math.cos(D)D
08	dload_1		
09	ldc2_w	#2	< 0x401c0000 0x00000000 = D 7.0 >
12	6ddiv		
13	invokestatic	#362	java/lang/Math.sin(D)D
16	dadd		
17	ldc2_w	#4	< 0x40000000 0x00000000 = D 2.0 >
20	dadd		
21	aload_0		
22	invokevirtual	#364	java/awt/Component.size()Ljava/awt/Dimension;
25	getfield	#31	java/awt/Dimension.height
28	i2d		
29	dmul		
30	ldc2_w	#6	< 0x40100000 0x00000000 = D 4.0 >
33	ddiv		
34	dreturn		

method #294 paint(Ljava/awt/Graphics;)V

<u>loc</u>	<u>opcode</u>	<u>argument</u>	<u>meaning of arg</u>
0	iconst_0		
01	istore_2		
02	goto	32	(location 32)
05	aload_1		
06	iload_2		
07	aload_0		
08	iload_2		
09	i2d		
10	invokevirtual	#125	GraphApplet.f(D)D
13	d2i		
14	iload_2		
15	iconst_1		
16	iadd		
17	aload_0		
18	iload_2		
19	iconst_1		
20	iadd		
21	i2d		
22	invokevirtual	#125	GraphApplet.f(D)D
25	d2i		
26	invokevirtual	#107	java/awt/Graphics.drawLine(III)V
29	iinc	21	(incr local arg #2 by +1)
32	iload_2		
33	aload_0		
34	invokevirtual	#364	java/awt/Component.size()Ljava/awt/Dimension;
37	getfield	#32	java/awt/Dimension.width
40	if_icmplt	5	(location 5)
43	return		